Small Business Innovation Research/Small Business Tech Transfer

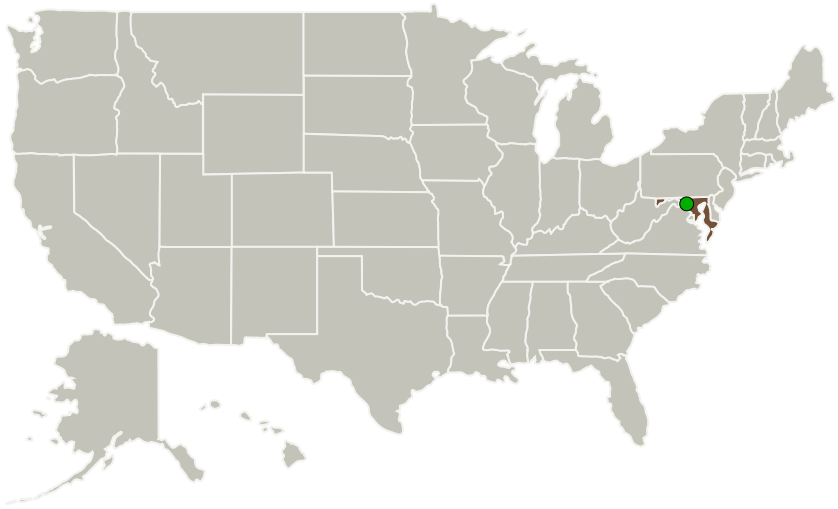
Silicon Carbide Integrated Circuits for Extreme Environment Operation: High Radiation and High Temperature, Phase I

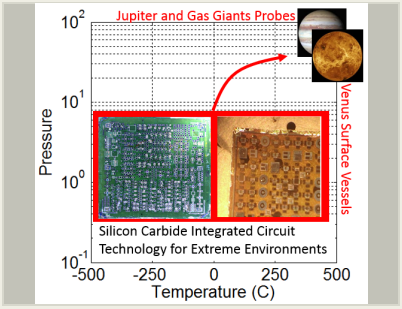
Completed Technology Project (2017 - 2017)

Project Introduction

To extend the survivability of high temperature extreme environment missions, we propose to design, fabricate and test silicon carbide integrated circuits that are radiation tolerant and high temperature operation capable. Bulk silicon electronics mostly cease to operate properly at temperatures above the 150C to 200C range due to high off-state leakage. The Silicon-On-Insulator version pushes this limit further to 300C; however, the Venus surface exploration systems and gas giant probes require electronics that can operate above this temperature. A solution for high temperature electronics is the use of devices fabricated using wide bandgap semiconductors. Silicon carbide as being the most mature wide bandgap technology and shown to operate at temperature as high as 500-600C offers alternative device and circuit solutions for high temperature electronics. To this end, CoolCAD has the expertise to design, layout and fabricate silicon carbide integrated circuits to address this need, and extend the useful lifetime of vessels and probes in extreme environments.

Primary U.S. Work Locations and Key Partners





Silicon Carbide Integrated Circuits for Extreme Environment Operation: High Radiation and High Temperature, Phase I Briefing Chart Image

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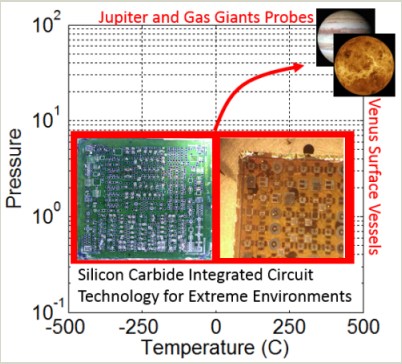
Organizations Performing Work	Role	Type	Location
CoolCAD Electronics, LLC	Lead Organization	Industry	Takoma Park, Maryland
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Images



Briefing Chart Image
Silicon Carbide Integrated Circuits for Extreme Environment Operation: High Radiation and High Temperature, Phase I Briefing Chart Image *(https://techport.nasa.gov/image/130700)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
CoolCAD Electronics, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

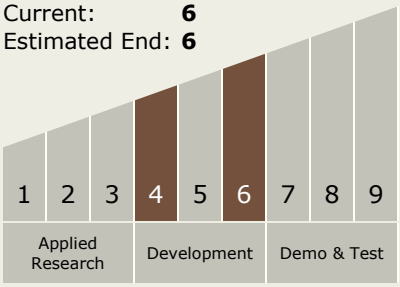
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Akin Akturk

Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.2 Electronics

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System